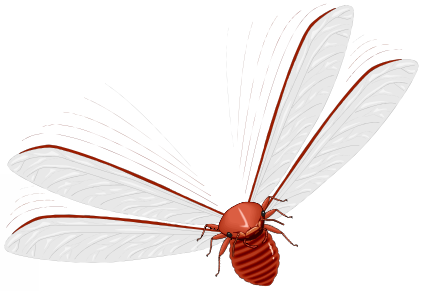
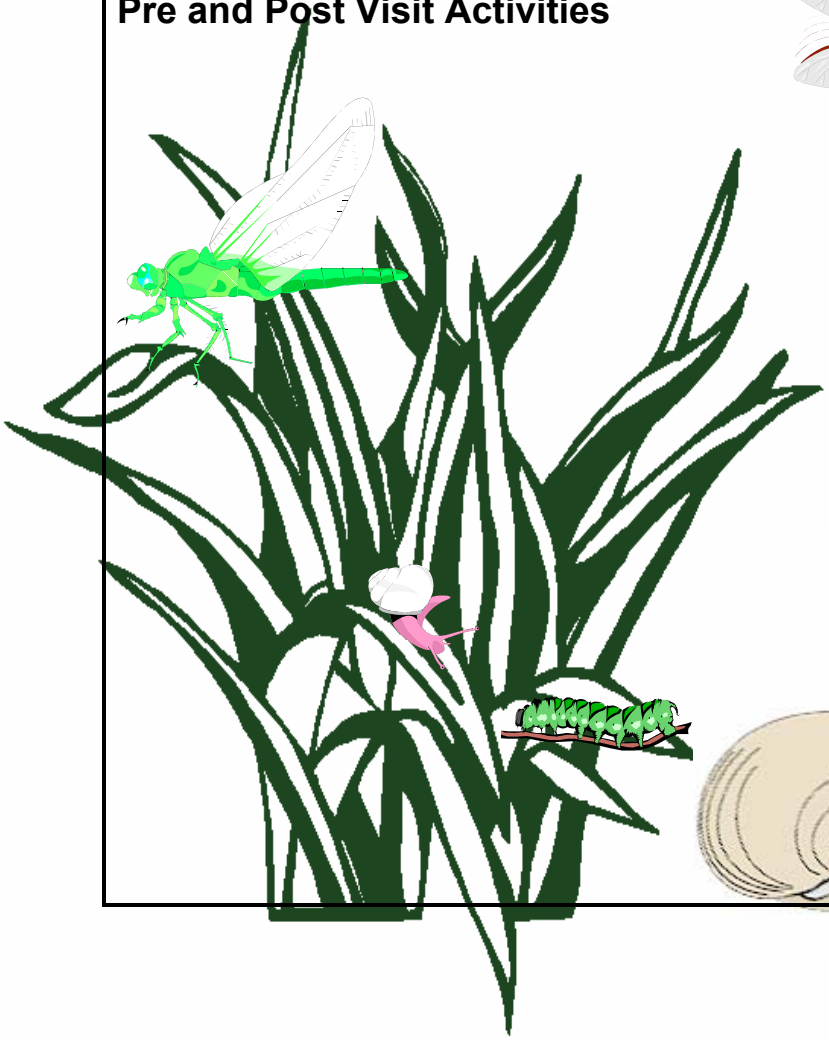
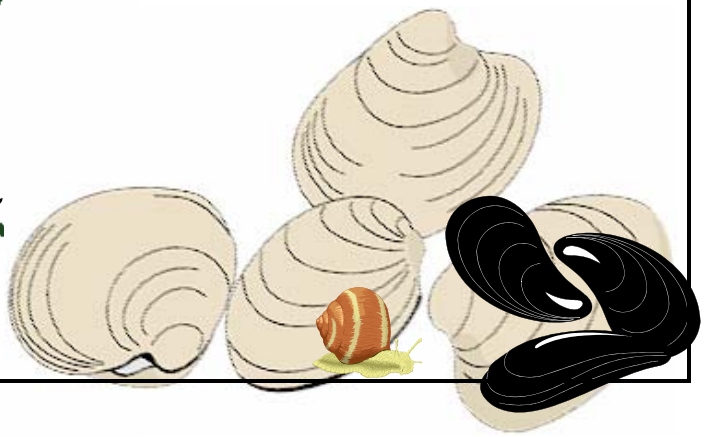
MARSH STUDY

ASSATEAGUE ISLAND NATIONAL SEASHORE

Grades 2-4
Pre and Post Visit Activities







INTRODUCTION

Thank you for selecting Assateague Island as a school visit location. What better way for students to learn about their environment than by experiencing a living classroom? You can make this visit an even more memorable one by creating a sense of anticipation. Try some of the pre and post visit activities in this packet to spark your students imaginations in preparation for their field trip.

Students arriving with prior knowledge of the resource will be better prepared to explore and retain what they learn during the program. Post visit activities can help students evaluate the experience and incorporate new information and ideas into relevant classroom discussion.

Please hold on to this set of materials so it can be used again next year.

Staff at Assateague Island National Seashore hope your school visit will be productive. Please fill out the attached evaluation. We are interested in your comments.

"Sandcerely"

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Maryland Voluntary State Curriculum

Marsh Muckers
Grade 2
Assateague Island National Seashore Program

Science Content Standards

1. Skills and Processes – Students will demonstrate the thinking and acting inherent in the practice of science.
A. Scientific Inquiry. 1. Seek information from readings, investigations, and/or oral communication.
B. Critical Thinking. 1. Describe the similarities and differences among objects, materials, and scientific concepts.
C. Applications of Science. 1. Apply scientific concepts to make decisions about an identified, relevant science issue.
D. Technology. 1. Recognize and explain that a model can be used to learn something about an object.
E. History of Science. 1. Recognize that people have investigated the world around us, answered scientific questions, and invented things.

2. Earth/Space Science – Students will use scientific skills and processes to explain the chemical and physical interactions (i.e., natural forces and cycles, transfer of energy) of the environment, Earth, and the universe that occur over time.
D. Astronomy. 3. Identify and describe the repeating patterns of celestial events.

4. Chemistry – Students will use scientific skills and processes to explain the composition, structure, and interactions of matter in order to support the predictability of structure and energy transformations.
B. Physical and/or Chemical Changes. 1. Identify and describe processes that can be used to change physical properties of materials.

6. Environmental Science – Students will use scientific skills and processes to explain the interactions of environmental factors (living and non-living) and analyze their impact from a local to a global perspective.
C. Natural Resources and Human Needs. 1. Recognize and explain how Earth's natural resources from the natural environment are used to meet human needs.
D. Environmental Issues. 1. Recognize and describe that the activities of individuals or groups of individuals can affect the environment.

(Selected standards may vary and will be represented in pre/post visit materials and education programming)

Maryland Voluntary State Curriculum

Marsh Muckers
Grade 3
Assateague Island National Seashore Program

Science Content Standards

1. Skills and Processes – Students will demonstrate the thinking and acting inherent in the practice of science.
A. Scientific Inquiry. 1. Access and process information from readings, investigations, and/or oral communications.
B. Critical Thinking. 1. Describe the similarities and differences among objects and scientific concepts.
C. Applications of Science. 1. Apply scientific concepts to make decisions about an identified, relevant science issue.
D. Technology. 1. Recognize and explain that a model can be used to learn something about an object, event, or situation.

2. Earth/Space Science – Students will use scientific skills and processes to explain the chemical and physical interactions (i.e., natural forces and cycles, transfer of energy) of the environment, Earth, and the universe that occur over time.
A. Materials and Processes That Shape A Planet. 1. Recognize and explain how physical weathering and erosion cause changes to Earth materials.

3. Life Science – Students will use scientific skills and processes to explain the dynamic nature of living things.
A. Cellular. 1. Recognize and explain that there are some organisms too small to be seen clearly with the unaided eye.
C. Evolution. 1. Describe how physical structures of plants and animals enable organisms to live in water and land environments.
E. Ecology. 1. Recognize and explain how the basic needs of organisms are provided by their habitats.

6. Environmental Science – Students will use scientific skills and processes to explain the interactions of environmental factors (living and non-living) and analyze their impact from a local to a global perspective.
D. Environmental Issues. 1. Recognize and explain the consequences that may occur when Earth's natural resources are used to meet human needs.

(Selected standards may vary and will be represented in pre/post visit materials and education programming)

Maryland Voluntary State Curriculum

Marsh Muckers
Grade 4
Assateague Island National Seashore Program

Science Content Standards

1. Skills and Processes – Students will demonstrate the thinking and acting inherent in the practice of science.
A. Scientific Inquiry. 1. Access and process information from readings, investigations, and/or oral communications.
B. Critical Thinking. 1. Describe and compare similarities and differences among objects and scientific concepts.
C. Applications of Science. 1. Apply scientific concepts to make decisions about a relevant science issue.
D. Technology. 1. Recognize and explain how the changes made to models can apply to real objects, events, and situations.

2. Earth/Space Science – Students will use scientific skills and processes to explain the chemical and physical interactions (i.e., natural forces and cycles, transfer of energy) of the environment, Earth, and the universe that occur over time.
E. Interactions of Hydrosphere and Atmosphere. 1. Recognize and explain the relationship of the sun to the water cycle.

3. Life Science – Students will use scientific skills and processes to explain the dynamic nature of living things.
C. Evolution. 1. Recognize and explain that organisms and groups of organisms that are best suited to an environment survive and reproduce.

6. Environmental Science – Students will use scientific skills and processes to explain the interactions of environmental factors (living and non-living) and analyze their impact from a local to a global perspective.
B. Interdependence of Organisms. 1. Recognize and explain that Earth's surface features and environmental conditions limit what types of organisms can survive.
D. Environmental Issues. 1. Recognize and describe that people depend on, change, and are affected by the environment.

(Selected standards may vary and will be represented in pre/post visit materials and education programming)

VIRGINIA STANDARDS OF LEARNING

Programs presented by National Park Service Staff In the Chincoteague National Wildlife Refuge

Wetland Studies
Grades 2- 4

Indicators (Programs will vary. Selected indicators will be represented in pre/post visit materials and education programming.)

Grade 2

- 2.4 The student will investigate and understand that plants and animals go through a series of orderly changes in their life cycles.
- 2.5 The student will investigate and understand that living things are part of a system.
- 2.6 The student will investigate and understand basic types and patterns of weather.
- 2.7 The student will investigate and understand that weather and seasonal changes affect plants, animals, and their surroundings.
- 2.8 The student will investigate and understand that plants produce oxygen and food, are a source of useful products, and provide benefits in nature.

Grade 3

- 3.4 The student will investigate and understand that behavioral and physical adaptations allow animals to respond to life needs.
- 3.5 The student will investigate and understand relationships among organisms in aquatic and terrestrial food chains
- 3.6 The student will investigate and understand that environments support a diversity of plants and animals that share limited resources.
- 3.7 The student will investigate and understand the major components of soil, its origin, and importance to plants and animals including humans.
- 3.8 The student will investigate and understand basic sequences and cycles occurring in nature.
- 3.10 The student will investigate and understand that natural events and human influences can affect the survival of species.

Grade 4

- 4.4 The student will investigate and understand basic plant anatomy and life processes.
- 4.5 The student will investigate and understand how plants and animals in an ecosystem interact with one another and the nonliving environment.
- 4.8 The student will investigate and understand important Virginia natural resources.

WETLAND WORD LIST FOR TEACHERS

- **Please choose the appropriate vocabulary words to use with your class.**
- **The underlined portion of each definition is simplified and may be used with younger students.**
- **The portion of the definition not underlined is provided for teachers, but may be used with students.**

Adaptation -- special ways plants and animals are able to survive; modifications an organism makes in order to adjust and better survive in its environment.

Bacteria -- microscopic animals that help with decomposition, single-celled organisms; some of which contribute to decomposition processes in wetlands.

Black needlerush -- a very needle-sharp tipped, round stemmed rush that grows in dense stands in high marsh areas.

Blue crab --- a beautifully colored crustacean with olive green carapace and bright blue claws. The blue crab has excellent eyesight, is a proficient swimmer thanks to its fifth pair of paddling legs; an important commercial species.

Byssal threads -- These threads attach the ribbed mussel to the salt marsh cordgrass roots to hold them in place; fibrous thread produced by the mussel for attachment.

Camouflage -- animals that blend in with their surroundings; animals use their color, patterns, shapes or behaviors that allow animals to blend in with the surroundings. For instance, some animals have colors that enable them to hide from predators.

Clam -- one of the most easily recognized bivalves. Clams live below the surface, have siphons for filtering plankton and detritus, and a foot for burrowing.

Coffee bean snail -- salt marsh snail – a small snail living in the high marsh under layers of detritus or on grass stems, it has an air-breathing lung and does not live immersed in water.

Consumers – These animals can not make their own food, they must eat other plants or animals.

Decomposers -- microscopic organisms that cause dead plants and animals to rot or decay, organisms, mainly bacteria, that break down dead plants and animals into simpler substances.

Detritus -- marsh mud; decomposed plant and animal debris, detritus is the basis of the food chain in the salt marsh. It is food for zooplankton, filter feeders and young marine life.

Dragonflies -- are beautiful flying insects found in wetland areas. Dragonflies and damselflies capture their prey on the wing by forming a basket with their legs.

Eel grass -- underwater seagrass, with roots in the bay bottom, growing in relatively shallow water where sunlight can reach and photosynthesis can take place, flowering and pollination takes place underwater.

Egrets -- beautiful long legged wading birds found in shallows and wetlands. Three white egrets visit Assateague; the Great egret is the largest, the Snowy egret, and the small Cattle egret. Egrets and herons eat fish, snails, crabs and insects.

Fiddler crab – small crabs living in muddy marshlands, males have one large claw ("the fiddle") he will wave to keep trespassers away or to attract a mate. Females have two small claws. Fiddlers are active during low tide, at high tide they retreat into their burrows plugging their holes behind them.

Filter feeder -- animals that filter food from the water; these animals are specially adapted for feeding on microscopic plankton and detritus.

Fresh water -- water without dissolved salts. Tap water is fresh water.

Food chain -- sunlight helps plants grow, plants are eaten by animals, animals are eaten by other animals, a passage of energy or food from producers (plants) to plant eaters (herbivores) and meat eaters (carnivores), the consumers.

Glasswort -- is a salt tolerant marsh plant with fleshy round stem-like leaves; plant turns bright red in the fall.

Habitat -- where a plant or animal lives, its natural home.

Herons -- beautiful long legged wading birds found in shallows and wetlands. Great blue, Little blue, and Tricolor are commonly seen herons at Assateague. Herons and egrets are closely related and both eat fish, snails, crabs and insects.

High marsh -- upper areas of the marsh only flooded periodically during extreme tides and storms, salt meadow hay, black needle rush and some shrubs grow here.

Low marsh -- lowest area of the marsh, flooded twice a day from tides, salt marsh cord grass grows here.

Mosquitoes -- a small buzzing, biting insect that lives and breeds in wetland areas, female mosquitoes need blood to produce eggs, eggs are deposited in wet areas and hatch in about two weeks, the larvae ("wrigglers") feed on algae and plankton until the pupa stage, after this period of inactivity, the adults emerge. Male mosquitoes feed on pollen and nectar.

Mummichogs -- Native American word meaning "go in groups", schools of mummichogs minnows live in the shallows of the bay and marsh and feed on mosquito larva, a type of killifish, chubby with rounded tails and protruding lower jaw.

Muskrat -- a brown, glossy furred mammal with a scaly tail, about the size of a small cat. Muskrats live in salt water or fresh water; they build lodges, are excellent swimmers, and eat fish, frogs, crayfish, and vegetation.

Mussels, *ribbed mussels* -- have ribbed shells and live attached to the base of salt marsh cord grass on the edge of the marsh, *blue mussels* -- have blue-black smooth shells and live

attached to hard surfaces like sea walls and piers; mussels are filter feeding bivalves, they attach to surfaces with byssal threads.

Nutrients -- elements or compounds needed for the reproduction, survival or growth of plants and animals.

Osprey -- **"**fish hawk", a large hawk, eat fish caught in their talons, build nests of sticks in old trees, channel markers, nesting platforms etc., mate for life, return to same nesting area each year.

Periwinkle – a univalve (snail), found living on the stems of salt marsh cordgrass and black needlerush feeding on algae and detritus.

Photosynthesis -- the process by which green plants produce their own food with energy from the sun, carbon dioxide and water are utilized and oxygen is released in the process.

Pioneer plant -- a plant that is able to take hold in an area with generally harsh growing conditions, pioneer plants create conditions that enable other plants to get a foothold.

Plankton -- microscopic plants and animals that float in the water at the mercy of the winds and currents, most have limited swimming abilities.

Predator -- An animal that hunts and kills other animals for food.

Producers -- plants produce their own food with energy from the sun.

Purple marsh crab – small crabs living in the salt marsh, they have square shaped shells and their eyes are found at the corners. Marsh crabs are often mistaken for female fiddler crabs. Marsh crabs share many of the same areas as fiddler crabs.

Raccoon – the familiar black masked, ring tailed, brown mammal, very common in wetland areas, raccoons at Assateague eat crabs and mussels in the salt marsh.

River otter -- a dark brown, sleek furred, long whiskered mammal, graceful, powerful swimmer, lives in salt water and fresh water, feed on fish, crayfish, crabs and frogs.

Salt marsh -- a grassy transition zone between the land and salt water, a nursery area for many forms of life in the marine environment.

Salt marsh cordgrass – a coarse grass growing in low marsh, adapted to growth in salt water, excretes excess salt through plant cell walls, primary detrital ingredient.

Salt meadow hay – grass growing in high marsh, salt tolerant plant, adapted to periodic tidal flooding.

Salt panne -- a depression found usually in the high marsh, floods only during the highest tides, soil is too salty for most marsh plants, bacteria may thrive in these areas, as detrital material accumulates and plants take hold, salt pannes may eventually evolve back to marsh.

Salt water -- water with many dissolved salts and minerals. The oceans are salt (with an average salinity of 35 ppt (parts per thousand)), and many bays and estuaries are salty.

Scavenger -- an animal that feeds on dead animal or dead plant material.

Submerged aquatic vegetation (SAV) -- underwater seagrass beds, a unique underwater habitat that provides a safe nursery area for young marine life, adds detrital matter, holds bay bottom in place, helps absorb wave action, helps filter debris from water, and adds oxygen to the water.

Tides -- result from the gravitation pull between the earth, sun and the moon; the surface of the ocean is flexible and forms bulges as a result of the moon and sun's gravitational pull on the earth; tides occur as the earth and moon rotate around the sun; high tides occur when the bulge passes, low tides occur between bulges.

Waterfowl – ducks and geese use wetlands for food sources, nesting areas and resting places.

Wetland -- a unique landform characterized by the presence of water, only specially adapted plants and animals live here.

ASSATEAGUE ISLAND WETLAND BINGO

Generalization: Wetlands are productive and valuable resources.

Objectives:
1. Students will be able to define at least 3 words or phrases from the Wetland Vocabulary list.
2. Students will be able to identify some of the animals associated with the wetland habitats.

Preparation: Make enough copies of the bingo sheet for each student. Select words or phrases from the vocabulary list to use in the bingo game. Collect a few prizes should you choose to present awards to winners.

Materials: Bingo sheets, chips (if you are doing the simplest form of the game), awards, colored pencils.

Procedure:
Have a little fun with Wetland Words while preparing students for their visit to the island. Assateague Wetland Bingo is designed to introduce students to vocabulary associated with wetlands.

<u>Youngest students</u>

1. Select 9 words from the vocabulary list and print them on the board.
2. Distribute bingo sheets.
3. Discuss words and provide a short definition.
4. Have students write each <u>definition</u> (or descriptive phrase) in whichever block they choose so that each bingo sheet is different. They must also leave room to write the matching vocabulary word.
5. Make sure the students understand that every block should display a short definition (and room to write the matching vocabulary word). No empty blocks.
6. Once students are ready, begin calling out vocabulary words. Don't forget to keep track of the words so they can be properly matched for the winners.

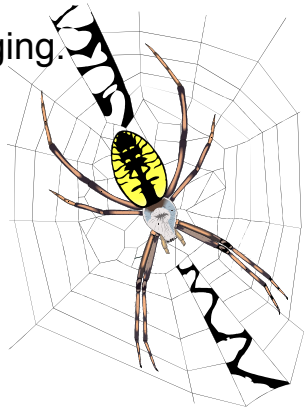
7. Students must match the correct definition to each vocabulary word. They should write these in a bright colored pencil so they can easily tell when they have 3 across, down, or diagonal.
8. A student should call out “Assateague!” when they have 3 in any direction. In order to win the game they must have matched the correct vocabulary word and definition.

<u>More challenging</u>

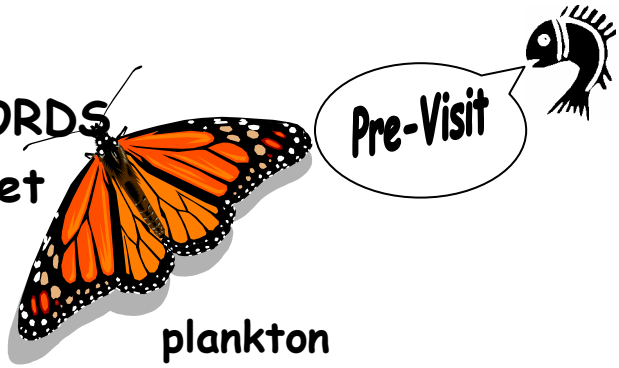
1. Select 10 or more words from the sheet or those you wish to cover from your own list. Explain to students that they will pick out 9 of these to write into blocks for the game.
2. Follow directions 2 through 8 from above description
3. Moving fast and steady make this game more challenging.

<u>Most challenging</u>

1. Distribute the 16-block bingo sheet.
2. Select 16 vocabulary words.
3. Follow directions 3 through 9 from above description.



WETLAND WORDS
Answer Sheet



Have students match each word with the meaning:

adaptation	**habitat**	**plankton**
bacteria	**high marsh**	**salt marsh**
camouflage	**low marsh**	**salt water**
detritus	**nutrients**	**seagrass beds**
filter feeder	**photosynthesis**	**tides**
fresh water	**pioneer plant**	**wetland**

1. A special area of land where water is present most of the time is called a ____**wetland**____.
2. _**Plankton**___ are microscopic plants and animals floating in the water and moving with the wind, tides and currents.
3. An ___**adaptation**_ is an adjustment made by a plant or animal in order to better survive in its environment.
4. Food, water, shelter and space are necessary for a plant or animal to live. This natural home is called a __**habitat**__.
5. ___**Fresh water**____ is water without dissolved salts, like tap water.
6. Plants and animals need __**nutrients**_____ in order to grow, reproduce and survive.
7. Decomposed plant and animal debris form marsh mud or __**detritus**___.

8. The grassy area between land and salt water is called the **_salt marsh_.**

9. Microscopic organisms called ___**bacteria**___ are responsible for decomposition in the salt marsh.

10. _**Salt water**_____ is water with many dissolved salts, like the ocean.

11. Plant and animals use color, patterns or shapes for __**camouflage**__ or blending in with the surroundings.

12. Underwater grasses or _**seagrass beds**___, provide a safe habitat for marine creatures. The roots help hold the bay bottom in place, and the grass blades help clean and add oxygen to the water.

13. The _**high marsh**___ is the upper area of the marsh. This area is flooded only now and then by stormy weather.

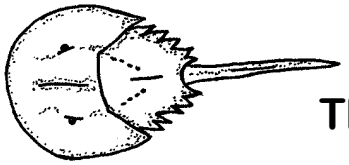
14. __**Pioneer plants**____ are the first plants to grow in an area. They improve soil conditions so other plants can begin to grow.

15. Animals that strain nutrients like plankton and detritus from the water are called ___**filter feeders**____.

16. The __**low marsh**____ is the lowest area of the marsh. This area is flooded daily by tides.

17. _**Tides**___ result from the gravitational pull between the earth, sun and moon. This cycle occurs twice daily and about 50 minutes later each day.

18. Green plants use the energy from the sun to convert carbon dioxide and water into food. Oxygen is released in this process called **photosynthesis**.



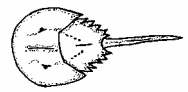
The Horseshoe Crab

Fact Sheet

- **<u>Horseshoe Crabs are completely harmless creatures!</u>**
- **The Horseshoe Crab is more closely related to ticks, spiders and scorpions than other crabs.**
- **The Horseshoe Crab has been living in the ocean for at least 250 million years…well before dinosaurs roamed the earth! It is sometimes called a "living fossil" since the species has not changed in appearance over millions of years.**
- **The Horseshoe Crab can be found from the coast of Maine to the Yucatan Peninsula.**
- **The Horseshoe Crab can grow up to 36 inches in length including the tail.**
- **Horseshoe Crabs can live for at least 15 years.**
- **Female Horseshoe Crabs grow larger than the males and can weigh up to 10 pounds.**
- **Horseshoe Crabs are classified as invertebrates (they have no backbone).**
- **Horseshoe Crabs have an exoskeleton (external skeleton), which they must shed in order to grow larger.**
- **Their bodies are divided into three parts; a helmet-shaped front shell, a hinged middle section, and a long spike tail.**
- **The tail, or telson, is not a defense mechanism. It is used to turn themselves right side up when they are upside down.**
- **Horseshoe Crabs have many eyes. They have two large compound eyes on either side of the outer helmet which can magnify sunlight 10 times! Two simple eyes at the front of their helmet sense ultra violet rays from the moon. They also have 5 eye spots and light sensors on their tail!**
- **Horseshoe Crabs have 5 pairs of legs. The first four pairs of legs are for walking and each is out fitted with a claw at the tip. The fifth pair of legs are used for propulsion along the bottom and acts kind of like a ski pole. Each leg is joined at the opening to the mouth with bristly grinders. These bristles act as teeth and crush food as it moves into the mouth. This "chewing" action is only possible when the legs are moving. So the Horseshoe Crab has to move or wiggle its legs to eat!**
- **What do they eat? Mostly sea worms and clams, but they can go for up to a year with out eating anything at all. Horseshoe crabs serve as a primary food source for the juvenile loggerhead turtle.**
- **Male Horseshoe Crabs have "boxing glove" shaped claws on their first pair of legs. These specialized clasper claws are used for attachment at the back portion of the female Horseshoe Crab's shell during spawning.**

- **During high tide nights in May or June, the female will drag the attached male (or males, sometimes 3, 4, or 5!) up on ocean or bayside beaches. Here she will lay many clutches of eggs in the sand.**
- **Female Horseshoe Crabs can carry up to 88,000 eggs (each clutch can hold up to 4,000). After the eggs are laid, the female will then drag the male over them for fertilization.**
- **Many migratory shorebirds depend on this spectacular Horseshoe Crab spawning event for nourishment on their annual journey north to breeding grounds as far north as the arctic circle.**
- **In about two weeks, at high tide, baby horseshoe crabs will hatch from their eggs. These larval Horseshoe Crabs bear a striking resemblance to their parents, they are a much tinier, tailless, version.**
- **Once harvested by the ton in the 1900's to be dried and used for fertilizer, the Horseshoe Crab is now used by man for much more important reasons. It's copper based blood turns blue when exposed to oxygen. Medical researchers have discovered a component of this blue blood is capable of detecting poisons in human blood. The Horseshoe Crab's blood has become a precious resource in checking purity of medications intended for human use. Blood is drawn from the Horseshoe Crab and the crab is released unharmed!**
- **Chitin from the shell of the Horseshoe crab is used to help skin grafts of burn patients heal faster.**
- **The Horseshoe Crab can survive doses of radiation that would kill a human.**
- **The Horseshoe Crab can endure extremes in temperature and salinity.**
- **Researchers believe a cure for cancer may lie buried in the secrets of this fascinating animal.**

HOORAY FOR HORSESHOE CRABS!!!!!



Generalization: The horseshoe crab is a living prehistoric relic. It is one of the most misunderstood creatures in the ocean!

Objectives:
1. Students will become familiar with the fascinating and harmless horseshoe crab.
2. Students will be able to identify horseshoe crab's relatives and habits.
3. Students will be able to explain the valuable role the horseshoe crab plays in the web of life.

Preparation: Review the horseshoe crab fact sheet. Make copies of the horseshoe crab patterns in advance. Construction paper will run through the copy machine one sheet at a time. This may help speed up the pattern making process. Make copies of the Horseshoe Crab Warm Up and review the warm up answer sheet.

Materials: Horseshoe crab fact sheet and warm up activity, horseshoe crab pattern, brown construction paper, scissors, crayons, markers, blue paint, glue or stapler

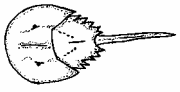
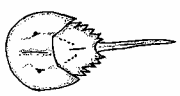
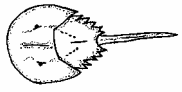
Procedure:
Do the Horseshoe Crab Warm Up as an anticipation exercise. Follow the instructions provided on the sheet.

Give each student a brown construction paper copy of the horseshoe crab pattern. Ask the students find the large head section of the horseshoe crab. Have students cut out the head section. Remind them to cut the small dotted line sections. At this point, review:

- *What is the function of the Horseshoe crab's shell?* It is for protection. It is the horseshoe crab's external skeleton.
- *How many eyes does the Horseshoe crab have?* The horseshoe crab has 2 large compound eyes on each side of the head, 2 small simple eyes on the front of the shell and 5 simple eyes under the front edge of the shell and at least one light sensor on the telson (tail). The horseshoe crab is able to see fairly well, sense light and darkness, and detect the phases of the moon. It cannot see colors, however.

Have students find the middle section of the horseshoe crab and cut it out. Review:

- *What is the function of this middle section of the horseshoe crab?* This section protects the horseshoe crab's respiratory organ, the book gills.
- *What is the function of the spines on this middle section?* The spines are movable and protect the horseshoe crab's gills. The gills are the only soft areas of the horseshoe crab's body. Predators like sea gulls or raccoons often feed on the gill area.

Have students find the tail section of the horseshoe crab and cut it out. Review:

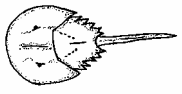
- *What is the function of the horseshoe crab's tail or telson?* The horseshoe crab uses its tail as a mechanism for turning over if it finds itself on its back. The tail is also used as a bit of a rudder when the horseshoe crab is crawling or swimming. The tail is not a stinger, nor is it used as a weapon.
- *Why is it important not to pick a horseshoe crab up by the tail?* The tail may break off. A very small muscle attaches the tail to the middle section. It would be like picking a person up by the ear!
- *What happens to a horseshoe crab if its tail is broken off?* If the tail is broken off a horseshoe crab, infection may set in and weaken or kill the animal. If the horseshoe crab found itself on its back, it would be unable to turn over, thus becoming vulnerable to desiccation (if out of water) and predators.

Have students find the leg parts of the horseshoe crab and cut them out. Review:

- *Can the horseshoe crab pinch you?* The horseshoe crab has very weak claws. The claws are designed for grasping soft marine animals such as worms and soft-shelled clams. If the horseshoe crab had sharp scissor-like claws, it would cut its food in half before it got to its mouth. The claws will hold on to your finger with a good grip but no pain!
- *How many legs does a horseshoe crab have?* The horseshoe crab has 5 pairs of legs. The first 4 pairs are for walking and feeding. The last pair act as ski poles and push the crab along the bottom.
- *Are there any differences between the male and female horseshoe crab's claws?* Yes! The first pair of claws on the horseshoe crab may tell you if it is a male or a female. A female has the typical scissor shaped claws. A male has "boxing glove" or "thumb's up" shaped claws designed for clasping onto the back portion of the female's shell during spawning. Young horseshoe crabs all have scissor shaped claws!
- *Can the horseshoe crab hurt you?* NO WAY! Horseshoe crabs do not bite, sting or pinch! Their mouth is located in the center of all the legs. The entrance to the mouth is bristly like a toothbrush. The horseshoe crab must wiggle its legs or walk in order to "chew" its food. The horseshoe crab looks scary, but its equipment poses no harm to humans, only worms and other soft creatures!

To assemble the horseshoe crab: *The teacher may choose to staple or tape the student's horseshoe crabs to save time, as gluing or pasting will have to allow drying time.

- Start with the head section. Attach the areas marked "a." Tuck outside "a" over inside "a" to achieve a 3-dimensional front shell.
- Next, attach the middle section to the head at "b." Put middle section "b" under head section "b" and attach.
- Attach the tail to the middle section at "c". Attach tail "c" under middle section "c."
- Last, attach the legs to the underside of the head section. The longest pair of legs is last and should be facing the tail.



Some other details to keep in mind:

- Horseshoe crabs often pick up “hitchhikers”! Barnacles, slipper shells, tubeworms and bryozoans may attach and find a home on the crab’s shell. These creatures do not harm the horseshoe crab. Horseshoe crabs must shed their shells many times in their life in order to grow larger. A new “clean” shell is free of “hitchhikers”, scratches and dings! An older shell will usually have scratches, dings and maybe a few “hitchhikers”. Students may want to decorate their horseshoe crabs with a few “hitchhikers”!
- Horseshoe crabs have copper based blood which turns blue when exposed to oxygen. This is unlike iron based human blood that turns red in the presence of oxygen. Horseshoe crab blood has been extremely valuable in medical research. Blood is extracted from the horseshoe crab without harm, and the crab is released. The blood is used in the study of diseases like Spinal Meningitis and cancer. A component of the horseshoe crab’s blood has proven to be invaluable in testing drugs before they are given to humans. The component, lysate, will clot in the presence of toxins thus indicating the drug is unsafe for humans.

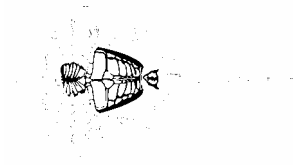
You might wish to repeat the warm up activity at this point.

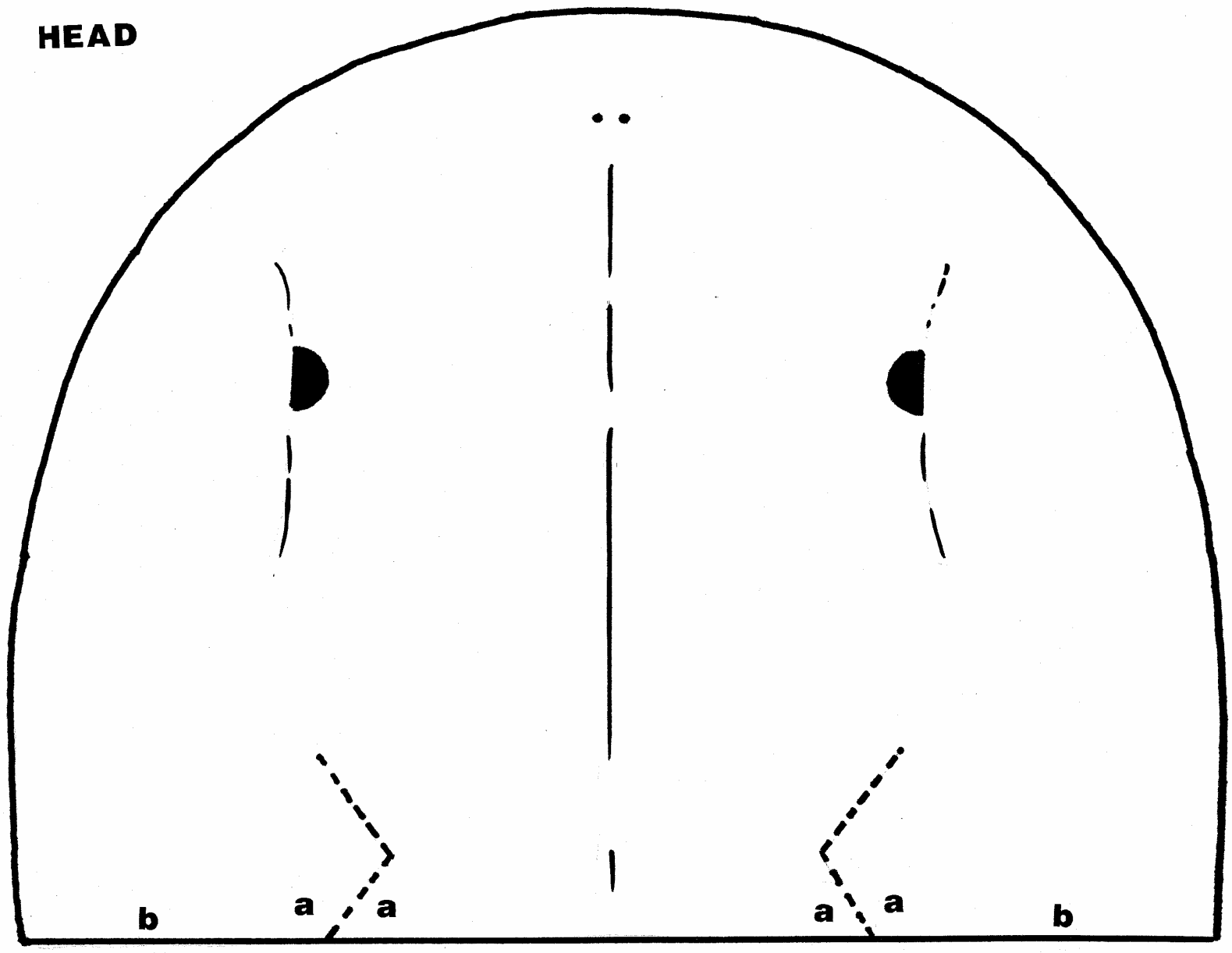
Horseshoe crabs are harmless, fascinating creatures. This one-of-a-kind creature deserves our attention. Horseshoe crabs migrate to the Delaware Bay region to spawn. Hundreds of thousands of horseshoe crabs crawl on the beaches to lay their eggs. Thousands of migrating shorebirds heading to breeding areas near the arctic circle depend on the horseshoe crab eggs for nourishment on this long journey. Horseshoe crabs are gathered from the beaches during this time by the thousands and loaded into trucks. They are being harvested by the boatload everyday, all for use as bait in eel and whelk pots. These practices have had a profound effect on the population of Horseshoe crabs in recent years. Their decline has in turn, caused a drastic decline in migrating shorebird species.

It is important for everyone to know that “scary, creepy-looking” creatures are not bad creatures. There is no “good” or “bad” in nature. Some creatures are dangerous and some are not. The horseshoe crab has survived over hundreds of millions of years, enduring drastic changes in global climates and ocean salinity, all to be possibly lost forever by the actions of people.

Extensions:

Visit the Delaware beaches during May and June to witness the horseshoe crab spawn. Contact Prime Hook National Wildlife Refuge, Delaware State Park System, or Delaware Department of Natural Resources for more information on spawning beaches to visit.

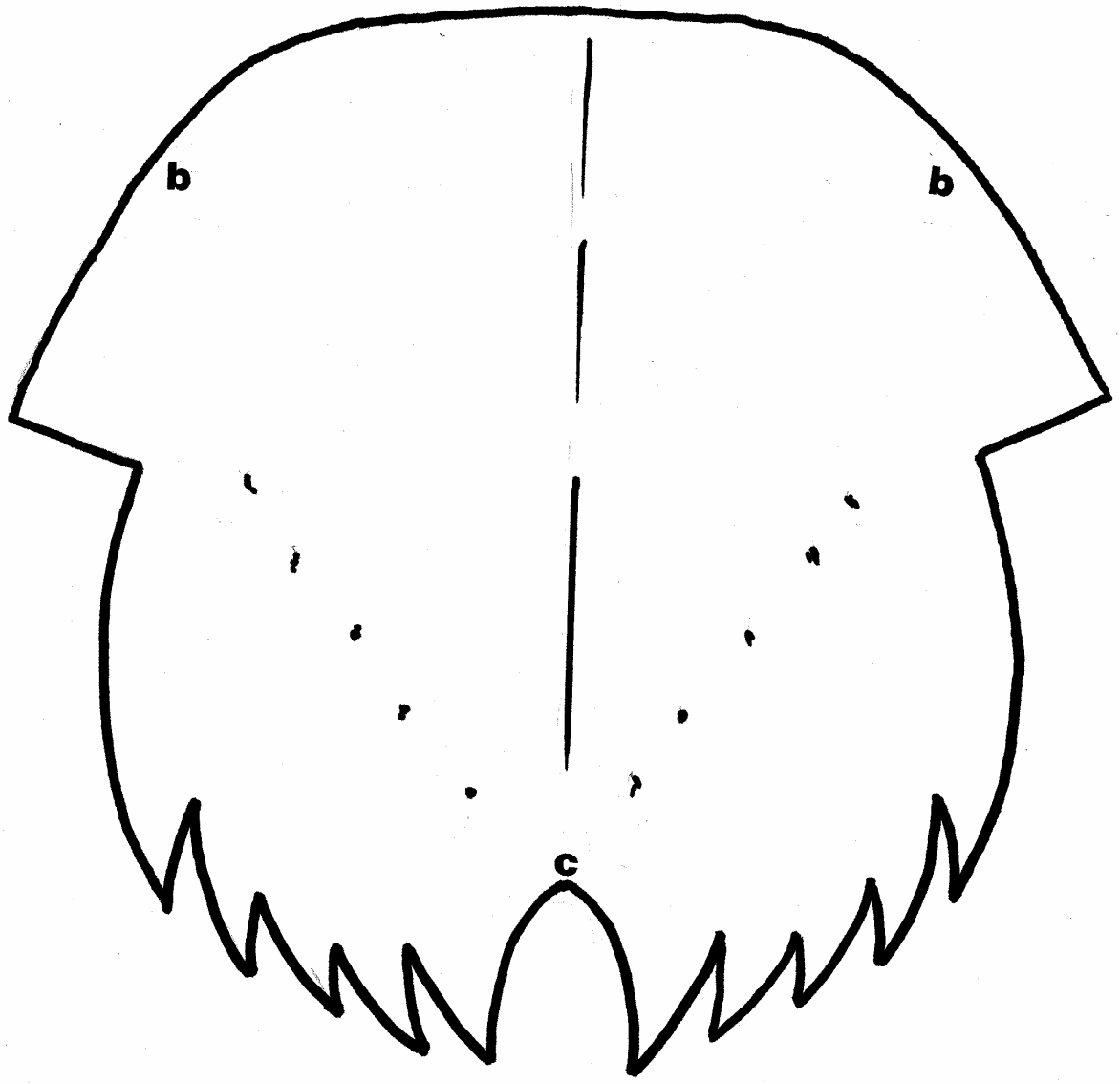




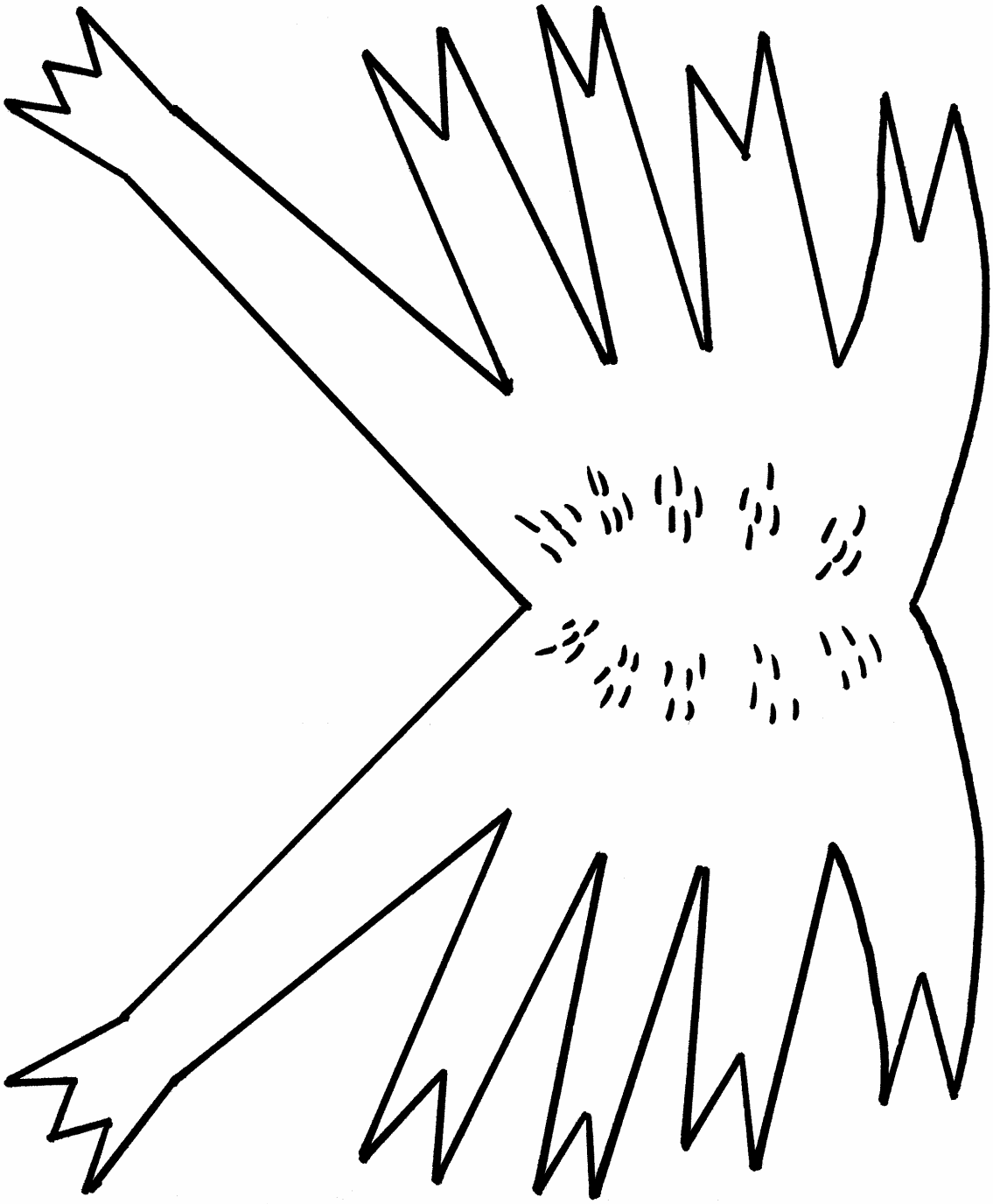
cut along dotted lines

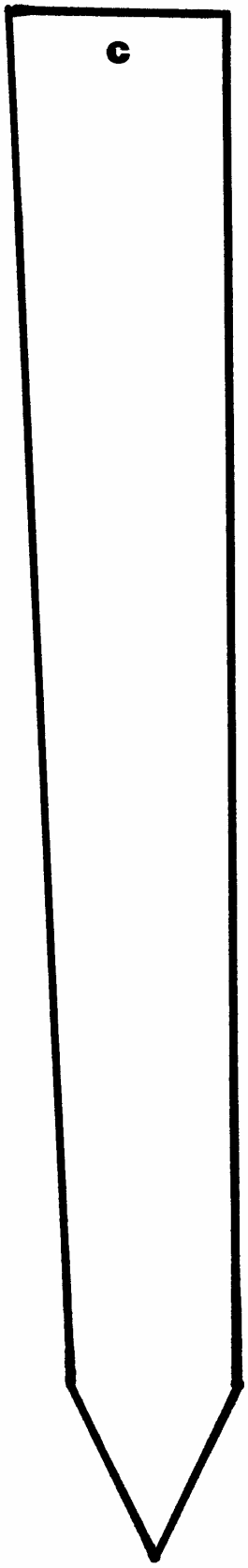
MIDDLE

(abdomen)



LEGS





TAIL

(telson)

HORSESHOE CRAB WORD SEARCH

ANSWER SHEET

Find these words hidden below.

ASSATEAGUE
BAY
BLUE BLOOD
BOOK GILLS
BOXING GLOVE
BROWN
CAMOUFLAGE
CLAMS
CLAWS
CRAWLS
EGGS
EYES
FOOD
HARMLESS
HORSESHOE CRAB
LIVING FOSSIL
OCEAN
PROTECTION
SANDY
SCISSOR SHAPED
SCORPION
SHELL
SHOREBIRDS
SPIDERS
SWIMS
TAIL
TELSON
TICKS
UPSIDE DOWN
WORMS

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        H O R S E S H O E C R A B   B A Y
                          L           S
L I V I N G F O S S I L A   S W I M S
                          W           A
      W O R M S           S H E L L   T
            S H O R E B I R D S       E F
U P S I D E D O W N                   A O
            B O X I N G G L O V E S   G O
                                      U D
  S C I S S O R S H A P E D           E
B O O K G I L L S     C R A W L S
                      A           A
  P R O T E C T I O N M           N     S
S       A       I     O C E A N D     C
P       I       C     U             Y B     O
I       L       K     F               R     R
D H A R M L E S S   B L U E B L O O D P
E         Y           A               W     I
R         E           G               N     O
S   C L A M S       T E L S O N         N
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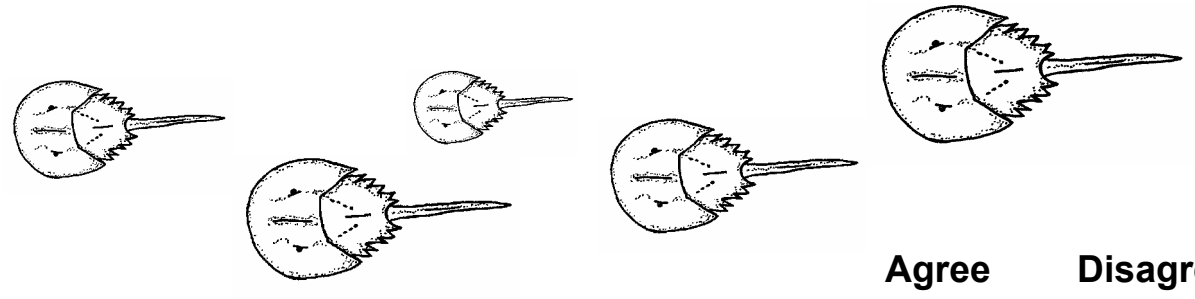
HORSESHOE CRAB WARM UP

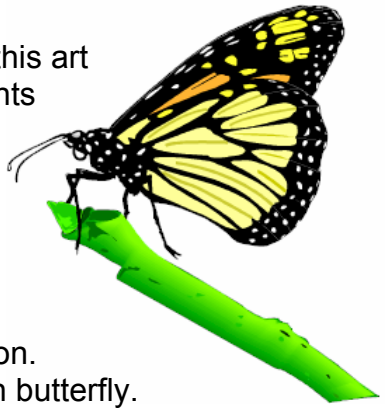
This activity is designed to determine what students already know or believe about horseshoe crabs. It can also be well used to discover what students have learned after a field trip as well. Have they changed their minds about previous answers?

Ask the students to answer these questions as a class or individually, before their field trip to the park. Have the students read each of the statements and mark agree or disagree depending on what they believe to be true. Explain to the class that they should try to explain why they made their choices. Of course, there will be incorrect answers! That is okay.



		Agree	Disagree
1.	**Horseshoe crabs are related to spiders.** Horseshoe crabs are not really crabs at all but more closely related to spiders, ticks, and scorpions.	✓	
2.	**Horseshoe crabs have lived on earth for millions of years.** Horseshoe crabs have lived on earth since before the time of dinosaurs.	✓	
3.	**Horseshoe crabs are dangerous.** Horseshoe crabs are harmless. Their tails are not stingers.		✓
4.	**Horseshoe crabs should be picked up by their tails.** Holding a horseshoe crab by the tail can weaken it so that it becomes useless for turning over or comes off altogether.		✓
5.	**Horseshoe crabs have red blood like humans.** Horseshoe crabs have blue, copper based, blood.		✓
6.	**Horseshoe crabs lay their eggs on the sandy beach.** Horseshoe crabs must come up onto the shore to lay their eggs, which will hatch a couple of weeks later.	✓	

MONARCH MIGRATION MANIA



Overview: Birds are not the only creatures that migrate. Use this art activity to teach about Monarch butterflies or migration. Students will make monarch rings and create a migration route through their school.

Theme: Monarch butterflies migrate.

Objectives:
1. Students will be able to describe the concept of migration.
2. Students will be able to identify life stages of a monarch butterfly.

Preparation: Make copies of the monarch worksheets and graphic.

Materials: Monarch worksheets and graphic pattern, crayons, paints and colored pencils, a monarch book (and perhaps a puppet), twist ties or pipe cleaners cut in half, hole punch.

Background information:

Background: Migration is the movement from one area to another and back again. When we think of migration, we generally think of birds, but other creatures migrate as well. Whales and dolphins make seasonal moves for feeding and reproductive purposes. Few of us think of butterflies when we think of migration and yet the diminutive monarch makes an epic journey of up to three thousand miles in search of the right place to spend the winter. It will return to the same roosts used by its great grandparents.

Assateague Island lies on the Atlantic pathway used by these beautiful creatures in their journey south to Mexico for the winter. The butterflies use the island as a resting and feeding point. They can sometimes be seen in great numbers from the beach to the bay in late September or early October. On windy days they may rest on the beach waiting for the right moment to resume their flight south. Look for this delicate creature feeding on seaside goldenrod in the inner dunes or in the salt marsh. This “weed” is an important food source for the monarch.

Procedure:
1. Read a book about monarch butterflies and discuss the content with your class.

2. Play **Monarch Word Find** using worksheets.

3. Make monarch butterfly rings.
    1. Provide each student with monarch graphic pattern.
    2. Instruct students to color the monarchs using black, orange and yellow colored pencils or crayons.
    3. Cut out the butterfly.
    4. Take a hole punch and punch a hole in the Monarch at “X”.
    5. Fold the twist ties or pipe cleaners in half and make a “U”.
    6. Students put the “U” around their finger with the ends pointing straight up.
    7. Slip the hole in the butterfly (right side up) through one of the twist ties or pipe cleaner ends.
    8. As the monarchs rest on the back of the students hand, twist the ties or pipe cleaners together securing the monarch “ring” and making antennae!

4. Once the butterflies rings have been made it is time to talk about migration.
   What is migration?
   Why do creatures migrate?
   What does the monarch butterfly need on its migration to survive?
   Why do the monarchs stop at Assateague on their journey?

5. Review each stage of the monarch butterfly....egg-larva or caterpillar-pupa or chrysalis-butterfly.

6. Design a migration route with your butterfly class. Explain to your class that the monarchs that emerge in fall live longer than those from the summer. These long lived monarchs (8 to 9 months as opposed to summer monarchs who live 3 - 5 weeks) are the individuals who will migrate to Mexico and back if they escape the many hazards along the way. Remember, it takes several generations of monarchs to tell the whole migration story.
    1. Start in fall in Canada along the Atlantic coast (your classroom)
    2. Begin flight south making stops for food and rest (other classrooms?) Don’t forget to make a stop at Assateague Island.
    3. Winter over in Mexico (the cafeteria or media room?) Make your winter roost a location where other students can admire the butterflies just as tourists do in Mexico.
    4. In spring begin your trip back. Don’t forget those rest and feeding stops but be sure to include stops on “milkweed” to lay eggs (the playground?).
    5. Remind students that the butterflies that hatch through the summer will only live a few weeks.
    6. Return to your classroom in Canada by the end of summer.

7. When students return to their class play the Monarch Matching and Monarch Word Scramble activities to review information they learned in class about this amazing butterfly.

Extensions:

Visit a monarch butterfly website. Try www.monarchwatch.org. Learn how monarchs are being tagged so we can learn more about their migration activities.

Learn about other animals that migrate. Identify whales and dolphins that migrate along the Atlantic Coast near Assateague Island.

Learn about the role that butterflies play in preserving the balance of nature. How do we depend on these creatures?

Select three very different creatures that make migrations. Examine the migration routes. How are the migrations the same? How do they differ? Why?

Make a poster that educates people about the importance of “weeds,” like goldenrod and milkweed, and how they can help wildlife like butterflies by creating butterfly gardens.

Find out if any other creatures have “mimics.”

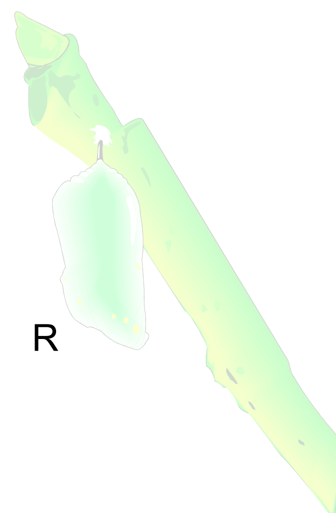
MONARCH WORD SEARCH

Pre/Post Visit

Answer Sheet

Find these words hidden below

ASSATEAGUE	MEXICO
BUTTERFLY	MIGRATE
CATERPILLAR	MILKWEED
CHRYSALIS	MONARCH
EGG	NECTAR
FLOWER	PUPA
FLIGHT	SCALES
GOLDENROD	SPINNERET
LARVA	WINGS



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									O										
									L										
									D										M
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C						M			R		A								K
A						O			O		T								W
L						N			D		E								E
E		P				A					R	F	L	O	W	E	R		E
S	B	U	T	T	E	R	F	L	Y		P								D
		P				C		A			I								
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Post-visit

STUDENT FIELD TRIP ASSESSMENT

Generalization: A student evaluation can be an effective assessment tool for teachers and park staff.

Objectives:

1. Students will describe whether or not they felt the experience was valuable to them as part of the curriculum.
2. Students will describe 3 things they learned during field trip or school visit.

Preparation: Make copies of the Student Evaluation sheet for each student.

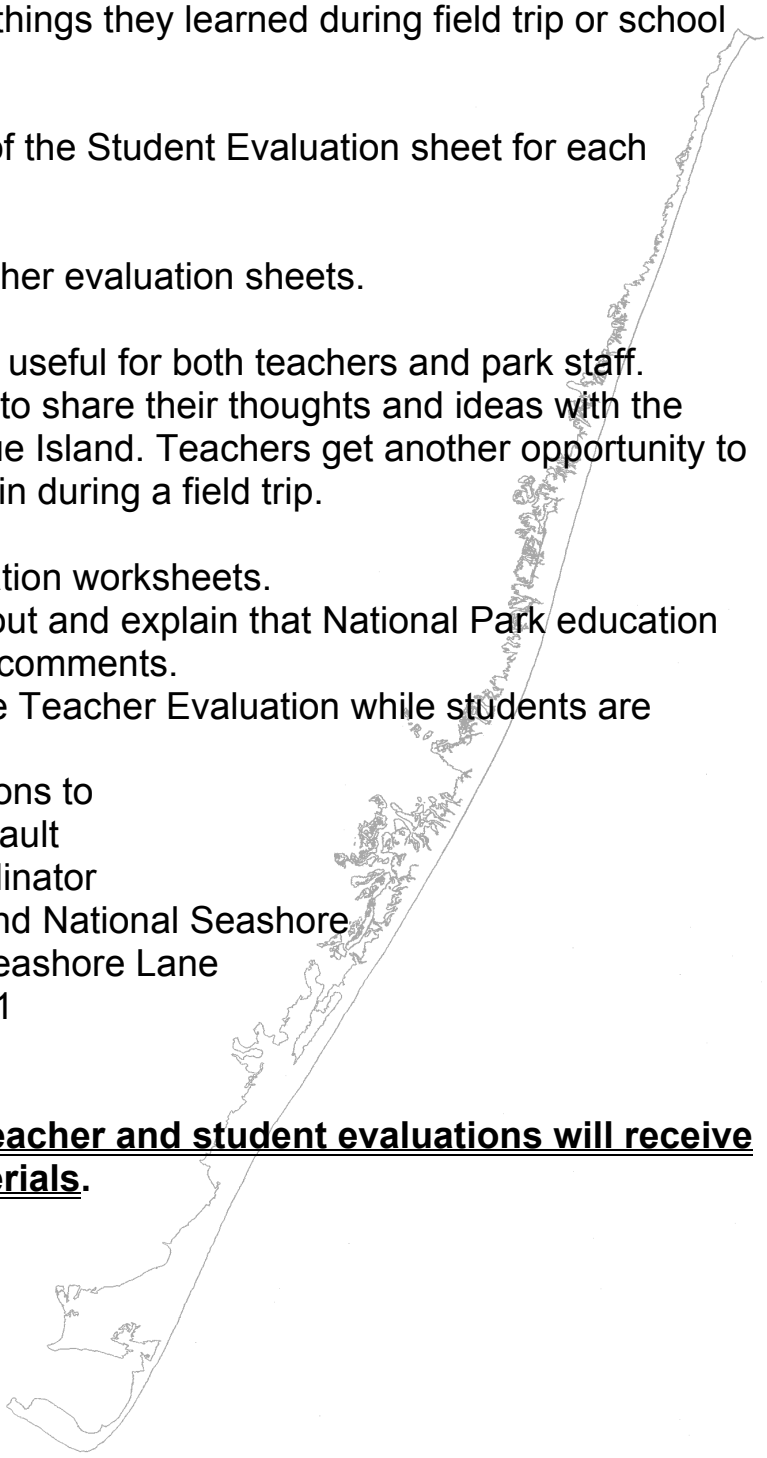
Materials: Student and teacher evaluation sheets.

Procedure: This exercise is useful for both teachers and park staff. Students get an opportunity to share their thoughts and ideas with the education staff at Assateague Island. Teachers get another opportunity to observe what students take in during a field trip.

1. Distribute Student Evaluation worksheets.
2. Ask students to fill them out and explain that National Park education staff is interested in their comments.
3. Teachers might fill out the Teacher Evaluation while students are working on theirs.
4. Mail both sets of evaluations to

   Rachelle Daigneault
   Education Coordinator
   Assateague Island National Seashore
   7206 National Seashore Lane
   Berlin, MD 21811

<u>Classes sending in both teacher and student evaluations will receive additional classroom materials</u>.



EVALUATION
Assateague Island National Seashore

Please share your thoughts with us. We need your help to provide the best educational experience possible.

School: _____

Grade Level: _____ Type of program: _____

Does the program relate to your curriculum? Explain.

_____

_____

Was the material presented at grade level? _____

Did the students enjoy the program? _____

Which activities were most effective and why? _____

_____

_____

Which activities were least effective and why? _____

_____

_____

Rate the extent to which the ranger was able to deliver the information in an interesting and enthusiastic manner.

Excellent Good Fair Poor Unable to Judge

Please comment if your response was "fair, poor, or unable to judge."

_____

_____

Please comment on any changes or additions that could be made to improve the visit.

_____

_____

_____

How did you use pre/post visit activities? Please comment on their effectiveness.

_____

_____

_____

Educators who fill out and return this evaluation to the address listed on the back will be sent additional classroom materials.

Thank you.
Please mail to:

Liz Davis
Education Coordinator
Assateague Island National Seashore
7206 National Seashore Lane
Berlin, MD 21811